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## PAIN AND STRENGTH MEASUREMENTS OF 1,507 SCHOOL CHILDREN IN SAGINAW, MICHIGAN.

By ADA CARMAN, Washington, D. C.

These measurements of least sensibility to pain, together with those of greatest strength, were made on 1,507 public school children in Saginaw, Michigan, through the permission and courtesy of Mr. A. S. Whitney, school Superintendent.

The instruments used in these experiments were a temple algometer and a hand dynamometer.

The temple algometer was designed by Arthur MacDonald, specialist in the U. S. Bureau of Education, and consists of a brass cylinder, with a steel rod running through one of the ends of the cylinder. This rod is attached to a spring and the cylinder is provided with scale and marker. The scale is graduated from 0 to 4,000 grammes. A brass disk 15 millimeters in diameter, at the end of the rod, is covered with flannel, so as to exclude the feeling of the metal when pressed against the skin.<sup>1</sup>

The disk is pressed against the temporal muscle, and as soon as the subject reports the pressure to be in the least disagreeable the amount is read from the scale. The purpose is to approximate as near as possible to the threshold of pain.

The Collin dynamometer was used.

Before the experiments were made the pupil answered the following questions in writing :

Name,

Age,

Sex,

Order of birth, 1st, 2d, or later born,

Color of hair,

Color of eyes,

Right or left handed,

Nationality of father and mother,

Education of father and mother,

Occupation of father and mother,

When the pupil could not answer any of the questions he was helped by his teacher or by the experimenter. At least twenty-five per cent. did not know the color of their hair, and at least fifty per cent. did not know the color of their eyes.

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<sup>1</sup> Described and illustrated in the Psychological Review, July, 1898.

Most of the children were of foreign parentage of the laboring classes, by which is meant artisans and unskilled laborers.

The tables give in grammes the least sensibility to pain by pressure on the temporal muscle, and in kilogrammes the greatest strength by grasp of hand.

TABLE I.

*Boys.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	96	2253	2191	16	14
11	104	2359	2337	19	15
12	123	2359	2337	21	18
13	152	2447	2432	22	20
14	101	2629	2523	26	23
15	79	2738	2656	30	27
16	53	2824	2700	35	30
17	33	3036	3023	40	35
18	15	3267	3077	42	38
10-18	756	2493	2466	24	21

TABLE II.

*Girls.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	86	1874	1827	11	10
11	102	2107	1983	13	12
12	132	1873	1788	15	14
13	107	2017	1997	18	16
14	84	1955	1961	20	17
15	82	2218	2165	21	18
16	66	2433	2283	21	18
17	48	2360	2330	23	22
18	25	2478	2374	24	22
19	19	2937	2705	23	20
10-19	751	2097	2030	17	16

TABLE III.  
*First born—Boys.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	20	2180	2178	15	12
11	40	2420	2363	18	16
12	31	2421	2390	21	18
13	55	2537	2461	22	20
14	25	2390	2208	27	23
15	23	2354	2189	29	26
16	20	2845	2603	38	33
17	8	3288	3163	43	37
18	4	3575	3275	40	37
10-18	226	2506	2405	24	21

TABLE IV.  
*First born—Girls.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	29	2167	2193	11	10
11	21	2136	2133	13	12
12	36	1956	1815	15	14
13	29	2174	2140	18	16
14	24	1973	1985	20	16
15	23	2203	1963	22	19
16	24	2369	2169	20	17
17	18	2344	2386	23	21
18	7	2236	2086	20	20
19	4	2825	3125	22	19
10-19	215	2163	2096	17	16

TABLE V.  
*Second born—Boys.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	28	2102	2009	16	14
11	15	2520	2570	18	16
12	28	2218	2115	21	19
13	31	2442	2490	23	21
14	28	2702	2613	25	23
15	15	3000	2847	31	27
16	15	2723	2708	31	28
17	8	3050	3500	38	35
18	4	3213	3113	40	33
10-18	172	2519	2489	24	21

TABLE VI.  
*Second born—Girls.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	28	1746	1714	11	10
11	35	2120	1929	13	11
13	32	1652	1633	15	13
13	24	1948	2023	17	15
14	18	2194	2142	20	17
15	19	2258	2289	23	19
16	16	2572	2397	20	19
17	9	2183	2211	21	22
18	2	3225	3150	28	21
19	6	3100	2717	21	21
10-19	189	2069	2008	17	15

TABLE VII.  
*Later born—Boys.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	48	2372	2302	16	14
11	49	2260	2245	18	15
12	64	2374	2409	20	17
13	66	2375	2381	23	20
14	48	2711	2635	26	23
15	41	2857	2849	30	25
16	18	2881	2803	33	29
17	17	2912	2732	39	35
18	7	3121	2943	45	42
10-18	358	2527	2493	24	21

TABLE VIII.  
*Later born—Girls.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	29	1703	1534	11	11
11	46	2004	1957	13	12
12	64	1938	1843	15	13
13	54	1964	1908	18	16
14	42	1843	1869	19	17
15	40	2208	2221	20	17
16	26	2406	2317	21	19
17	21	2498	2333	24	23
18	16	2491	2403	25	24
19	9	2878	2511	24	21
10-19	347	2080	1998	18	16

Taking the tables of boys we find (Table I) that the sensitivity to pain decreases as age increases, except at the age of twelve. The strength of grasp shows a regular increase. The left temple is more sensitive than the right temple.

Sensitiveness to pain decreases in order of birth (Tables III—VIII), first born boys being more sensitive than second born, and second born more sensitive than those of later birth. The strength of grasp is the same.

Divided into light and dark, based on color of eyes and hair, the boys with light eyes and hair are less sensitive and less strong than those with dark eyes and hair.

	Ages.	No. of Persons.	Average Sensibility.		Average Strength of Grasp.	
			Right Temple.	Left Temple.	Right Hand.	Left Hand.
Dark,	10-18	356	2462	2408	25	22
Light,	10-18	400	2570	2518	23	20

Of the 756 boys, 5 per cent. were left-handed, with an average of

Right Temple,	Left Temple.	Right Hand.
2439	2359	21

Boys reported by their teachers as bright were more sensitive than those reported as dull, and while stronger in the right hand, were weaker in the left hand than the dull.

	Average Sensibility.		Average Strength of Grasp.	
	Right Temple.	Left Temple.	Right Hand.	Left Hand.
Bright,	2158	2152	21	17
Dull,	2256	2217	20	18

Those reported as being especially dull in mathematics were more sensitive on the right temple than on the left temple, with an average sensibility of 2,015 on the right temple and 2,281 on the left temple. Strength of grasp, right hand 21, left hand 18.

All averages as to brightness and dullness are based on ages 10-14 inclusive, number of pupils 576.

With the girls (Table II) the decrease of sensibility to pain as age increases is not so regular as with the boys, though there is a general decrease. As with the boys the left temple is more sensitive than the right.

The first-born girls show less sensibility to pain than second-

born; later born less than second-born on left temple, but more on right temple (Tables IV, VI, VIII,). The strength of grasp varies.

Girls with light hair and blue or gray eyes are less sensitive to pain on left temple, and less strong than girls with dark hair and dark eyes. On right temple they are more sensitive than the dark.

	Ages.	No. of Persons.	Average Sensibility.		Average Strength of Grasp.	
			Right Temple.	Left Temple.	Right Hand.	Left Hand.
Dark, Light,	10-19	402	2113	1840	18	16
	10-19	349	2084	2022	17	15

Of the 751 girls 3.6 per cent. were left-handed, with an average of

Right Temple.	Left Temple.	Right Hand.	Left Hand.
1922	1952	21	19

Girls reported as bright were more sensitive and stronger than those reported as dull.

	Average Sensibility.		Average Strength of Grasp.	
	Right Temple.	Left Temple.	Right Hand.	Left Hand.
Bright,	1737	1736	16	13
Dull,	2094	1868	13	12

Those reported as being especially dull in mathematics were more sensitive on the right temple than on the left, with an average sensibility of 1,688 on the right and 1,763 on the left. Strength of grasp, right hand 14, left hand 13.

Averages as to brightness and dullness are based on ages 10-14 inclusive, number of pupils being 571.

As a summary we give the following:

With both boys and girls sensitiveness to pain decreases as age increases.

The left temple is more sensitive than the right temple.

Girls are more sensitive and weaker at all ages than boys.

In general, sensitiveness to pain decreases in order of birth, the exception being that later born girls are slightly more sensitive on the right temple than are the second born. Were the number of second born girls larger this exception might not occur. Strength of grasp remains the same with boys, while it varies with girls.

Boys with light hair and eyes are less sensitive and less strong than boys with dark hair and eyes. Girls with light hair and eyes are less sensitive on the left temple, but more sensitive on the right temple than girls with dark hair and eyes. They are also less strong.

Bright boys and girls are more sensitive to pain than dull boys, and in general are stronger.

Boys and girls especially dull in mathematics are more sensitive on the right temple than on the left temple.